National Transportation Safety Board

Sleep in an Operational Environment: What can go wrong?

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Board Member

NSBRI - NASA Workshop
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Federal Agencies: Transportation

NTSB

FMCSA

FRA

NHTSA

PHMSA

DOT

MARAD

FTA

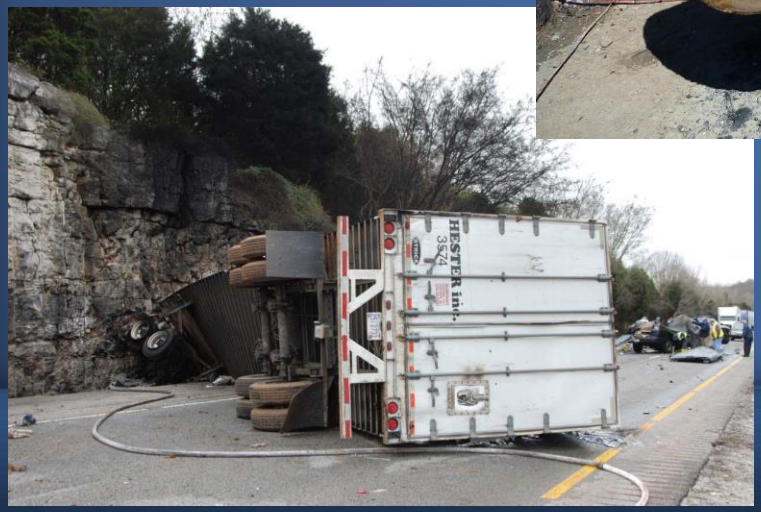
FHWA

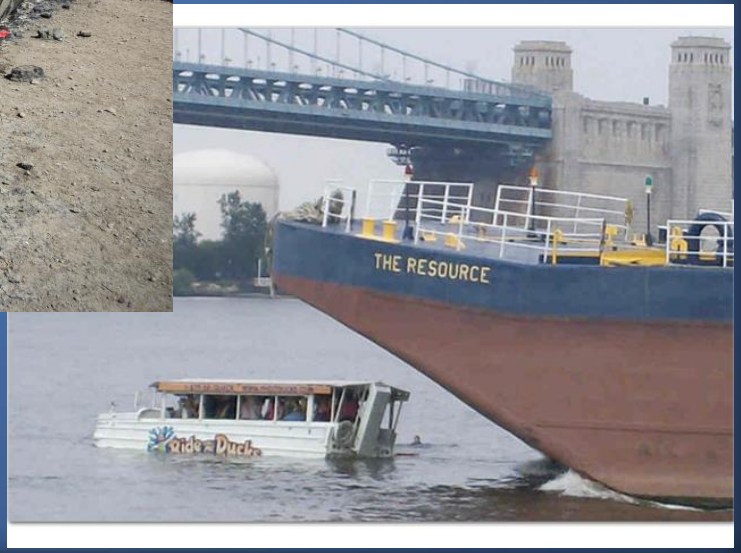
FAA

1) determining the probable cause of transportation accidents

2) making recommendations to prevent their recurrence

All Modes



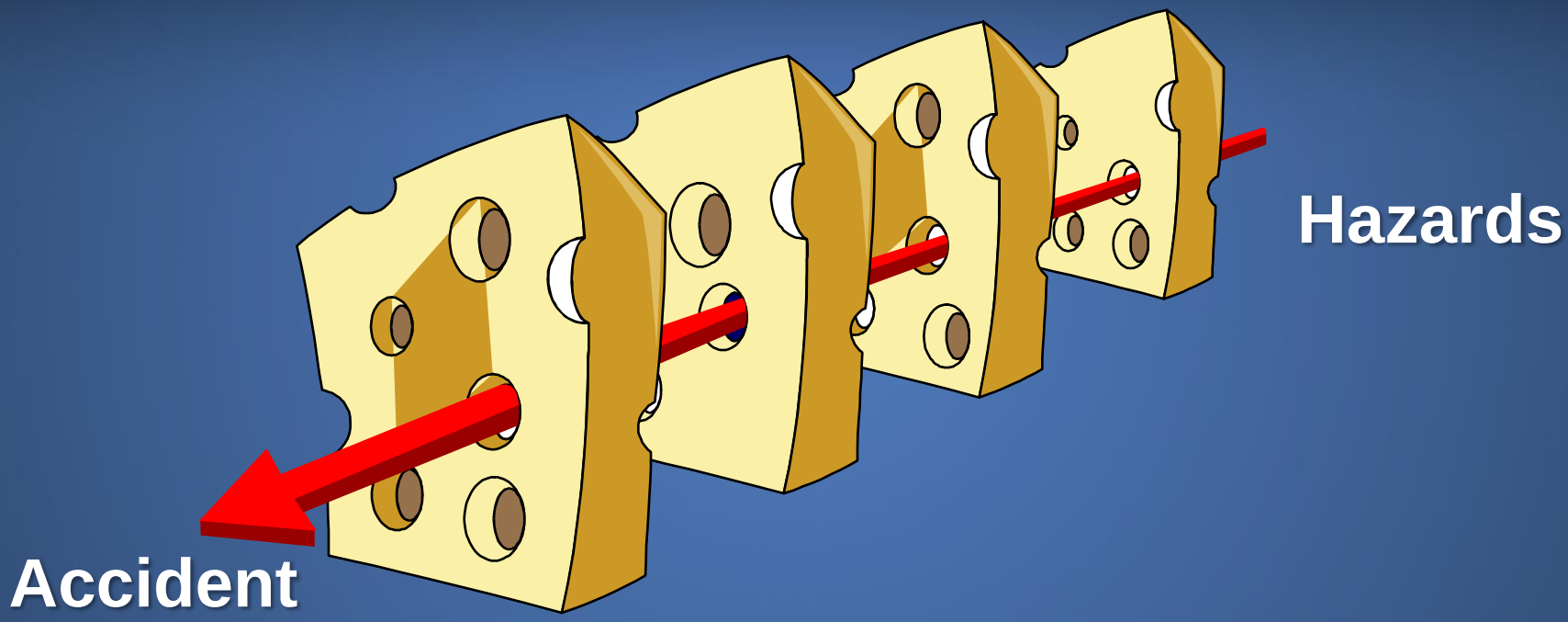


NTSB

Independent Federal Agency: Created in 1967

- >140,500 accident investigations
- 14,000+ safety recommendations
- ~ 2,300 organizations/recipients
- 82% acceptance rate

“Swiss Cheese” Model (Reason)



Successive layers of defenses, barriers, and safeguards

Challenges of a 24/7 Society

Four Fatigue Factors +

- Sleep loss
- Extended wakefulness
- Circadian/time of day
- Sleep disorders
- Other considerations

Uncontrolled In-Flight Collision with Terrain
AIA Flight 808, Douglas DC-8-61, N814CK
U.S. NAS, Guantanamo Bay, Cuba, August 18, 1993

First NTSB aviation accident investigation
to cite fatigue as probable cause

- acute sleep loss, sleep debt, circadian disruption

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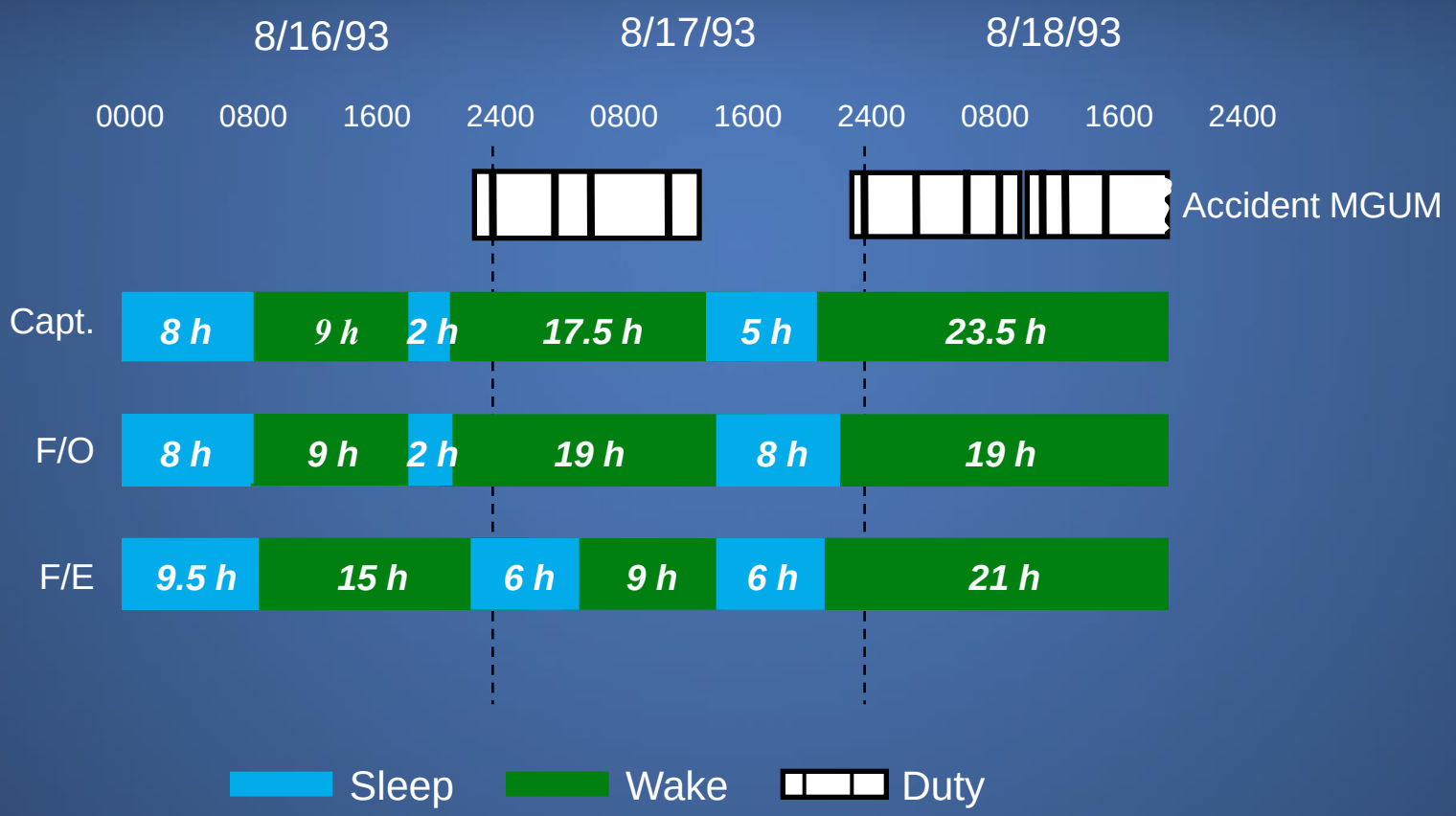
Crew Sleep History



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Observed Performance Effects

- Degraded decision-making
- Visual/cognitive fixation
- Poor communication/coordination
- Slowed reaction time

Uncontrolled In-Flight Collision with Terrain
AIA Flight 808, Douglas DC-8-61, N814CK
U.S. NAS, Guantanamo Bay, Cuba, August 18, 1993

"The National Transportation Safety Board determines that the probable causes of this accident were the impaired judgment, decision making, and flying abilities of the captain and flight crew due to the effects of fatigue…"

Miami, Oklahoma (June 26, 2009)
Fatigue Factors

- Off work for 3 weeks: day active/night sleep schedule
- 3am to 3pm shift work/drive schedule (since 1997)
- Early bedtime (2 hr phase advance in sleep time)
- Obtained min 3 hrs/max 5 hrs sleep prior to accident
- Subsequently diagnosed with mild sleep apnea


10 fatalities
3 serious injuries
2 minor injuries
5 no injuries
Ford
Windstar
Hyundai
Sonata
Kia
Spectra
Always
Save
Lowest Price...
Everyday
1874
481
Source: Oklahoma State Police

Probable Cause (fatigue)

"... driver's fatigue, caused by the combined effects of acute sleep loss, circadian disruption associated with his shift work schedule, and mild sleep apnea, which resulted in the driver's failure to react to slowing and stopped traffic ahead by applying the brakes or performing any evasive maneuver to avoid colliding with the traffic queue. . . ."

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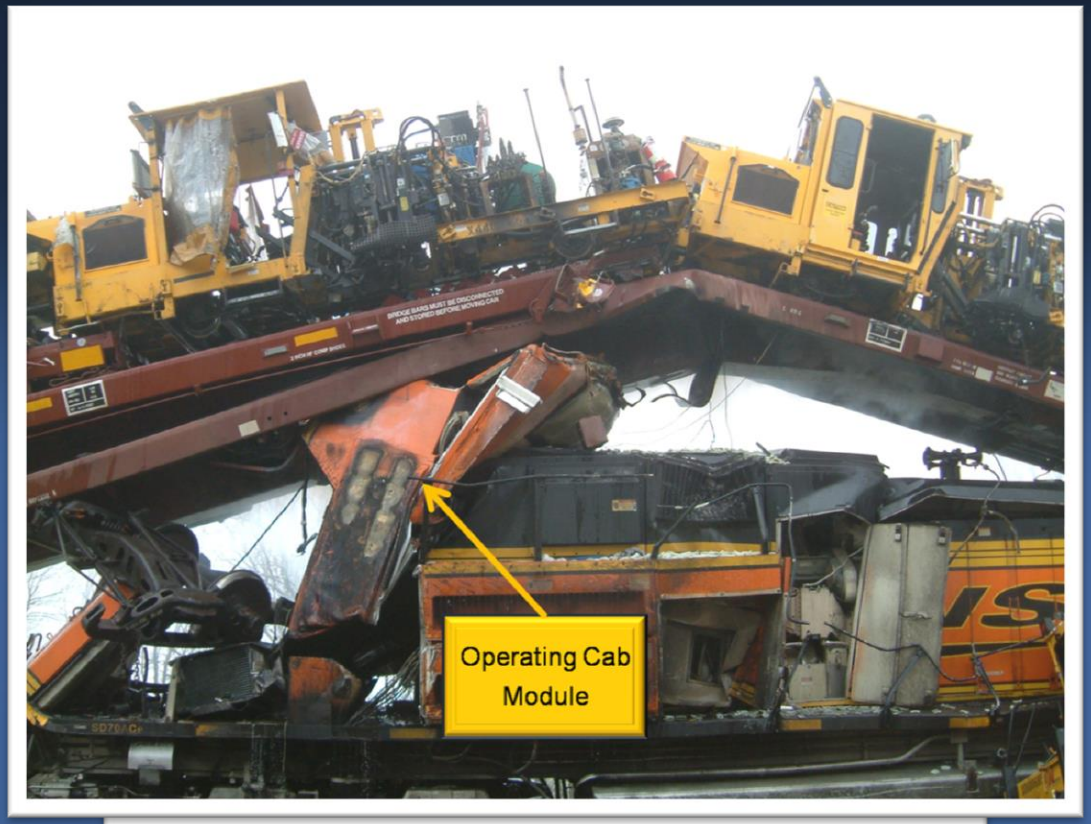
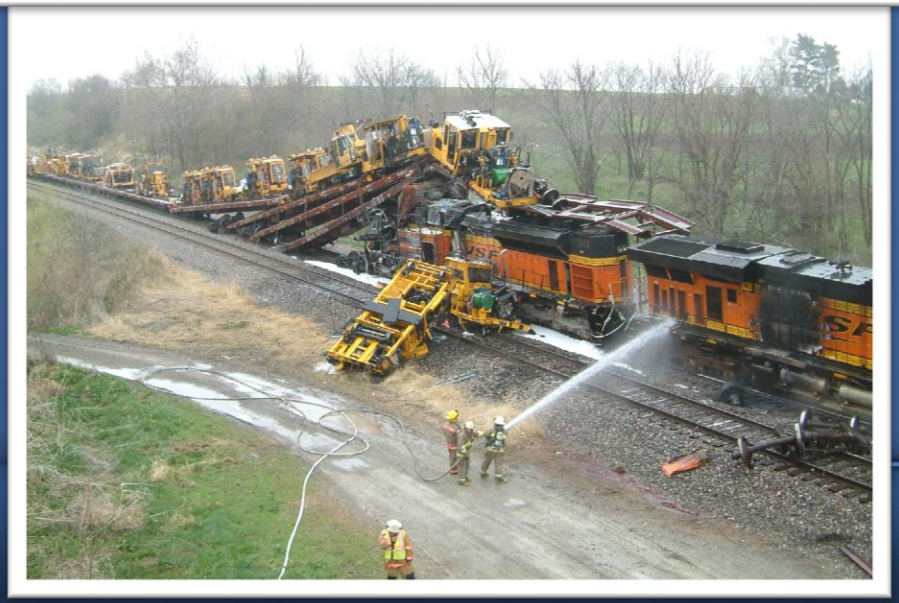
Track Path Animation

Collision Between Two BNSF Railway Freight Trains
Red Oak, Iowa
April 17, 2011
DCA11FR002





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Probable Cause (fatigue)

". . . failure of the crew of the striking train to comply with the signal indication requiring them to operate in accordance with restricted speed requirements and stop short of the standing train because they had fallen asleep due to fatigue resulting from their irregular work schedules and their medical conditions."

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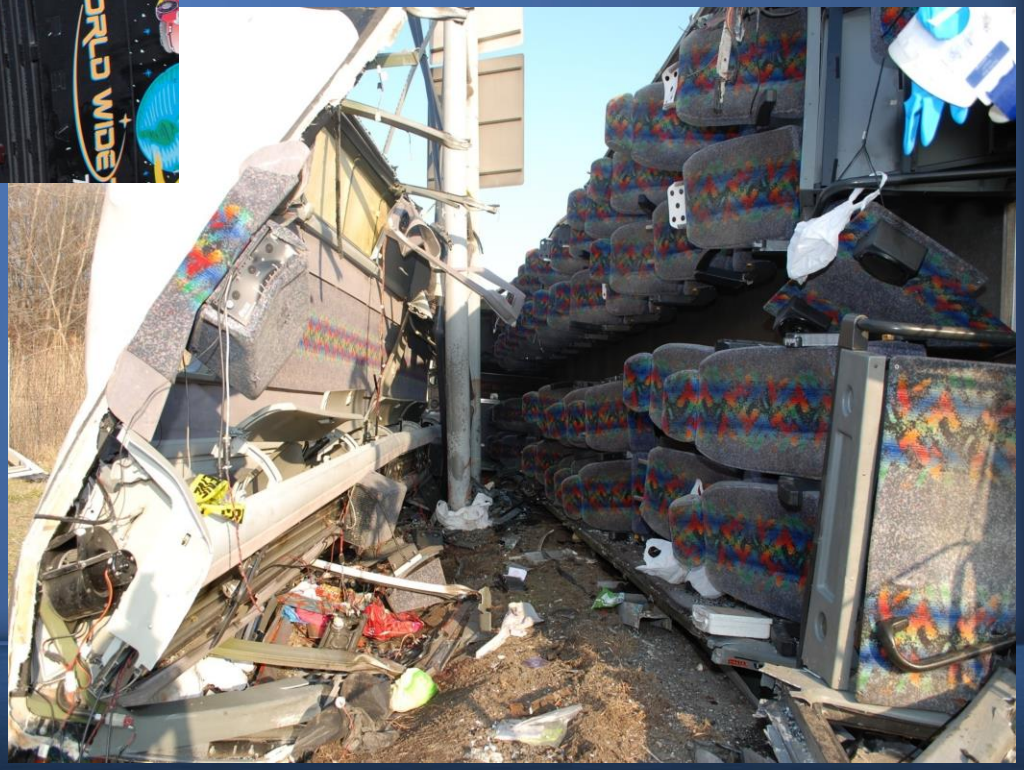
Animation of Accident Reconstruction

Motorcoach Run Off Road-Collision with Bridge Signpost

Interstate Highway 95 Southbound
New York, New York
March 12, 2011

HWY11MH005

‘Bronx Bus’, New York, NY (March 12, 2011)



15 fatalities

17 injuries

Probable Cause

"The National Transportation Safety Board determines that the probable cause of the accident was the motorcoach driver's failure to control the motorcoach due to fatigue resulting from failure to obtain adequate sleep, poor sleep quality, and the time of day at which the accident occurred."

Asiana 214 (July 6, 2013)
San Francisco, CA (SFO)

3 fatalities

49 seriously injured

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Probable Cause

Contributing to the accident were . . .

(5) flight crew fatigue, which likely degraded their performance.

Fatal Aviation Accidents (examples: fatigue cited)

- 8/97 Guam: 228 fatalities
- 6/99 Little Rock AK: 11 fatal
- 10/04 Kirksville MO: 11 fatalities
- 8/06 Lexington KY: 49 fatalities
- 7/08 Owatonna MN: 8 fatalities
- 2/09 Buffalo NY: 49 fatalities
- 6/09 Santa Fe NM: 2 fatalities
- 7/13 San Francisco, CA: 3 fatalities
- 8/13 Birmingham, AL: 2 fatalities

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SHARE

MOST WANTED LIST

A program to increase the public's awareness of, and support for, action to adopt safety steps that can help prevent accidents and save lives.
The following are ten of the current issues.

Addressing Human Fatigue

General Aviation Safety

Safety Management Systems

Runway Safety

Bus Occupant Safety

Pilot & Air Traffic Controller Professionalism

Recorders

Teen Driver Safety

Addressing Alcohol-Impaired Driving

Motorcycle Safety

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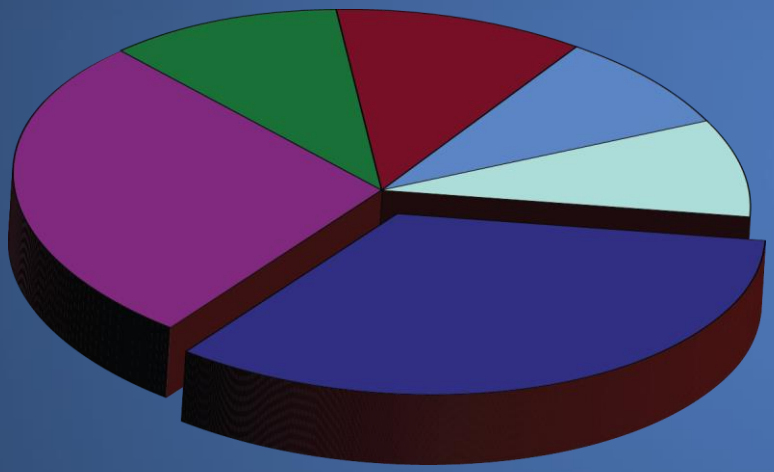
NTSB Safety Recommendations: Fatigue

- MOST WANTED 1990 - 2011
- > 200 fatigue recommendations

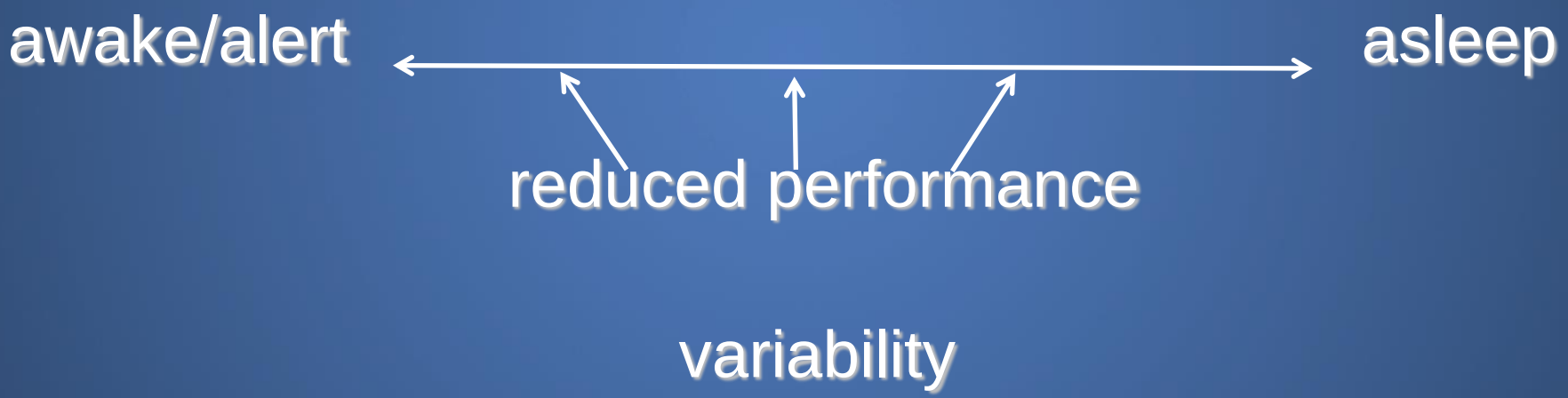
Complex Issue:



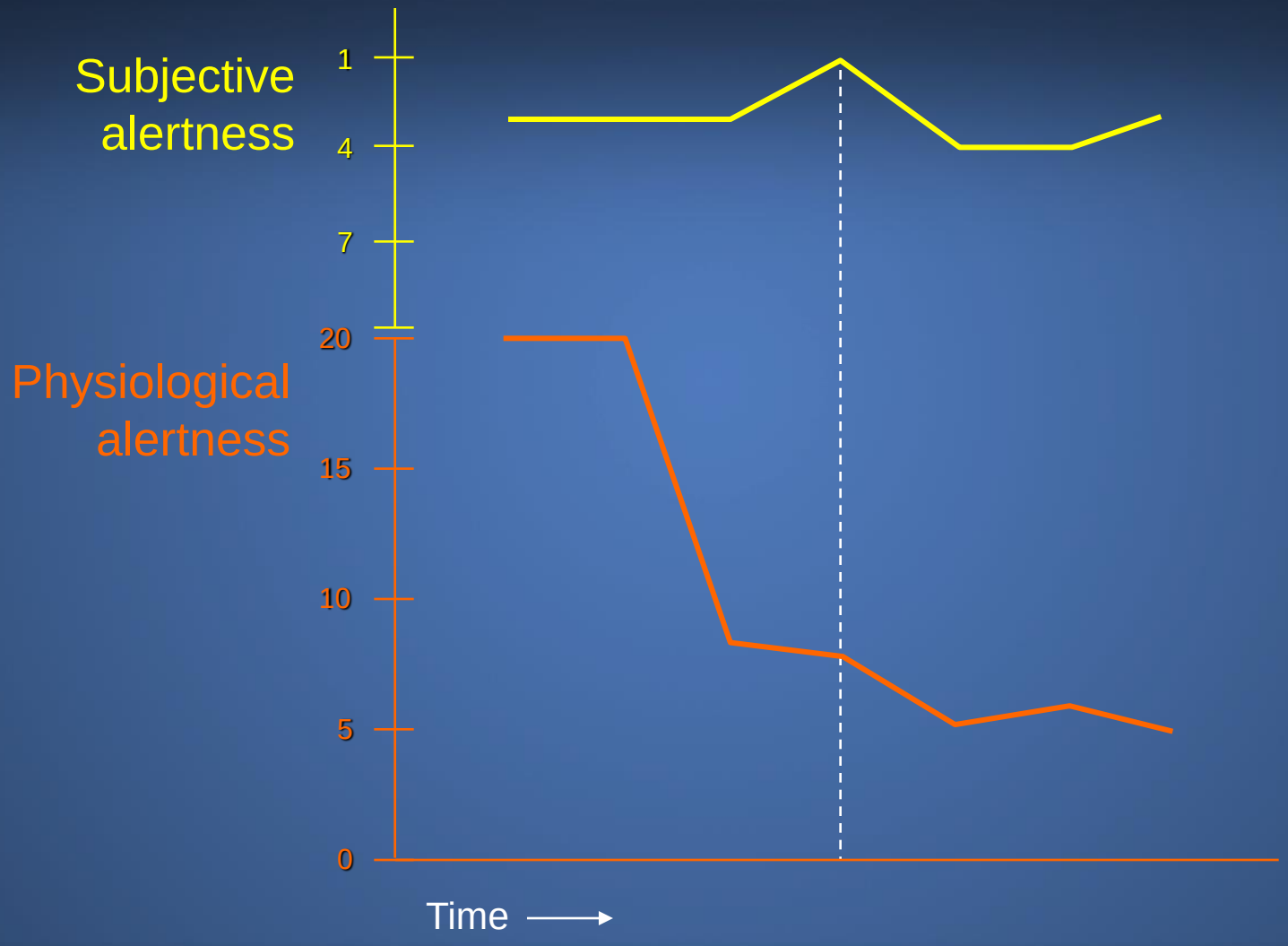
Requires Multiple Solutions

- Scheduling Policies and Practices
- Education/Awareness
- Organizational Strategies
- Healthy Sleep
- Vehicle and Environmental Strategies
- Research and Evaluation

Fatigue Risks



Alertness Reports Often Inaccurate



Adapted from Sasaki et al., 1986

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Good sleep, safe travels.

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